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Cavity-Nesting Birds of Arizona and New Mexico Forests



Virgil E. Scott

David R. Patton

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Sketches of typical cavity-nesting birds — in the text and on the cover — are by wildlife artist Bob Hines of the U.S. Fish and Wildlife Service, Washington, D.C.

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Cavity-Nesting Birds of

Arizona and New Mexico Forests

by

Virgil E. Scott, Research Biologist
Fish and Wildlife Service¹

David R. Patton, Principal Wildlife Biologist
Rocky Mountain Forest and Range Experiment Station²

¹ U.S. Department of the Interior, with headquarters at the Wildlife Research Center, Denver, Colorado. Author is assigned to field station headquarters at Tempe, Arizona.

² Forest Service, U.S. Department of Agriculture, with central headquarters at Fort Collins, in cooperation with Colorado State University. Author is located in Tempe, in cooperation with Arizona State University.

Cavity-Nesting Birds of Arizona and New Mexico Forests

Cavity-nesting birds depend on dead and unmerchantable trees for their roosting and nesting cover. In the West these trees generally are considered a fire hazard and are removed during logging operations. Also dead trees are routinely removed from intensively used areas to eliminate the hazard of falling trees. Foresters and recreation managers are becoming more aware of the esthetic and economic value of non-game wildlife, however, and need information on bird habitat requirements so they can be considered in management plans.

At least 41 species of birds (table 1) are known to use tree cavities in five southwestern forest types (table 2). Although little information has been published concerning the effect of removing dead trees on cavity-nesting bird populations, Zeleny (1972), Power (1966), Elliott (1945), Balda (1970), Allen and Nice (1952), and Burns (1960) suggest that the population density of some birds may depend on suitable nesting sites. Michael and Thornburgh (1971) indicated that a reduction of bird populations within a forest could result in harmful increases in insect populations.

In this report we have summarized published data and personal observations on the habits of cavity-nesting birds in southwestern National Forests. The information should be helpful to forest managers planning timber harvests or preparing environmental impact statements.

Much of the literature cited in this paper did not list scientific names for the plants and animals mentioned in the text. The common name used was sometimes so indefinite that only the class could be determined. The appendices list the common names of plants and animals and the scientific names when they were referred to in the references, or when they could be determined from the common name used. Unless otherwise noted, North American distribution is taken from *Audubon Western Bird Guide* (Pough 1957), Arizona distribution from *The Birds of Arizona* (Phillips et al. 1964), and New Mexico distribution from *New Mexico Birds* (Ligon 1961). Nomenclature follows the American Ornithologists' Union: *The A.O.U. Check-list of North American Birds*, fifth edition, as amended by Supplement 32 in *The Auk*, 1973, 90(2)411-419. Percentages of the diet under "Food" refer to percent volume unless otherwise indicated.

Table 1.—Cavity-nesting birds in southwestern forest types

Common name	Page no.	Major forest type ¹					Tree use ²		
		1	2	3	4	5	A	B	C
American kestrel	4		x	x	x			x	x
Screech owl	5			x	x	x		x	x
Whiskered owl	6			x	x	x		x	x
Flammulated owl	7	x	x	x	x	x		x	x
Pygmy owl	8		x	x				x	x
Elf owl	9				x	x		x	x
Spotted owl	10		x	x		x		x	x
Saw-whet owl	11		x	x				x	x
Coppery-tailed trogon	12				x	x		x	
Common flicker	13		x	x	x	x		x	x
Gila woodpecker	14			x	x	x		x	
Red-headed woodpecker	15			x	x		x	x	
Acorn woodpecker	16			x	x	x	x	x	x
Lewis' woodpecker	17		x	x			x	x	
Yellow-bellied sapsucker	18	x	x	x				x	
Williamson's sapsucker	19		x	x				x	
Hairy woodpecker	20	x	x	x	x		x	x	
Downy woodpecker	21	x	x	x			x	x	
Arizona woodpecker	22		x	x	x	x	x	x	
Northern three-toed woodpecker	23	x	x	x			x	x	
Ash-throated flycatcher	24			x	x			x	x
Olivaceous flycatcher	25			x	x	x		x	x
Violet-green swallow	26	x	x	x	x			x	x
Tree swallow	27		x	x				x	x
Purple martin	28		x	x	x			x	x
Black-capped chickadee	29	x	x	x				x	
Mexican chickadee	30	x	x	x				x	
Mountain chickadee	31	x	x	x	x			x	
Plain titmouse	32			x	x			x	
Bridled titmouse	33			x	x			x	
White-breasted nuthatch	34	x	x	x	x			x	
Red-breasted nuthatch	35	x	x	x				x	
Pygmy nuthatch	36	x	x	x	x			x	
Brown creeper	37	x	x	x	x			x	
House wren	38	x	x	x	x			x	
Brown-throated wren	39		x	x				x	
Winter wren	40		x	x	x			x	
Bewick's wren	41			x	x			x	
Eastern bluebird	42			x		x		x	x
Western bluebird	43		x	x				x	x
Mountain bluebird	44	x	x	x	x			x	x

¹ 1. Spruce-fir

2. Douglas-fir (Mixed conifer)

3. Ponderosa pine

4. Pinyon-juniper

5. Oak-woodland

² Primary use: A. Food B. Nest C. Perch

Table 2. Southwestern forest types [adapted from Little 1950]

Forest type	Characteristic plants	Elevation (feet)	Annual rainfall (inches)	New Mexico	Arizona
Spruce-fir forest (subalpine forest, Hudsonian and Canadian Life Zones).	Engelmann spruce, subalpine fir.	8,500-12,000	30-35	High mountains, especially Sangre de Cristo Range, Jemez, Sacramento, and Mogollon Mountains.	High mountains, especially White Mountains, San Francisco Mountain, and Kaibab Plateau.
Douglas-fir forest (montane forest, Canadian Life Zone).	Douglas-fir, white fir, quaking aspen, limber pine.	8,000-9,500	25-30	High mountains in western two-thirds.	High mountains in eastern and northern.
Ponderosa pine forest (Transition Life Zone).	Ponderosa pine.	5,500-8,500	19-25	Mountains in western two-thirds and northern eastern corner.	Mountains and plateaus in northeastern half.
Pinyon-juniper woodland (Upper Sonoran Life Zone).	Pinyon, Utah juniper, one-seed juniper, alligator juniper, Rocky Mountain juniper.	4,500-7,500	12-20	Plateaus, foothills, and mountains except eastern quarter.	Plateaus and mountains in northeastern half.
Oak woodland (Upper Sonoran Life Zone).	Emory oak, gray oak, Mexican blue oak, Arizona white oak.	4,500-6,000	12-20	Foothills and mountains in southern quarter.	Foothills and mountains in southeastern and central parts.

American kestrel (*Falco sparverius* Linnaeus)



Range: (Partially migratory) Breeds from Newfoundland, southern Quebec, northern Ontario, northwestern Mackenzie, and southeastern Alaska south through South America. Winters from central New England, central Illinois, Kansas, Utah, and southern British Columbia south.

Arizona: Apparently nests over entire State but becomes scarce in high mountains during winter.

New Mexico: Usually nests at 5,000 to 7,000 feet throughout the State, but has been found nesting at lower elevations in the southeast.

Nest: Usually nests in natural cavities or old woodpecker holes, mostly in dead trees. In Mississippi, Stockard (Bent 1961) found kestrels nesting so densely that they could almost be considered colonial; these birds were nesting in both natural cavities and abandoned woodpecker holes in a newly cleared field where many old snags had been left standing. We have found nests in woodpecker holes in dead ponderosa pine and in lightning scars of live trees. Smith et al. (1972) reported that, of 41 nests found in central Utah, 13 were in cliffs or buildings and 28 were in trees — 19 in flicker holes, 2 in magpie nests, and 7 in natural cavities.

Food: Mostly insects, small birds and mammals, reptiles, and amphibians. Where grasshoppers are plentiful, they are generally preferred (Bent 1961). Smith et al. (1972) found that insects accounted for almost 80 percent of total prey numbers but only 4 percent of the volume. Meadow mice, deer mice, and house sparrows were the vertebrates taken most often, and made up 96 percent of the volume.

Screech owl (*Otus asio* (Linnaeus))



Range: (Resident) from New Brunswick, Ontario, southern Manitoba, southern British Columbia, and southeastern Alaska to the Florida Keys, the U.S. Gulf Coast, and eastern Mexico.

Arizona: Common to abundant throughout open woods of the Sonoran Zones except in the northeast, where it is scarce. Follows junipers into the pine forest above Eagar. Prefers wide spacing of trees with grassy open spaces for hunting and feeding.

New Mexico: Found throughout the State, wherever there are hollow trees, from the lowest elevation in the south to as high as 8,000 feet in the north, but are most common in the oak-pine zone at about 7,000 feet.

Nest: Nests have been reported 5 to 50 feet above the ground in both natural cavities and flicker holes in apple, pine, poplar, and sycamore trees (Bent 1961).

Food: Major items are mice and insects. Fisher (1893) examined 255 screech owl stomachs and found birds in 38 (15 percent), mice in 91 (36 percent) and insects in 100 (39 percent). Other foods listed include shrews, rats, moles, flying squirrels, chipmunks, bats, crawfish, earthworms, lizards, frogs and toads, fish, spiders, and scorpions. The list of insects included June beetles, other beetles, cutworms, grasshoppers, locusts, crickets, cicadas, katydids, noctuid moths, caterpillars, and hellgrammites.

Whiskered owl (*Otus trichopsis* (Wagler))



Range: (Resident) From the Santa Catalina, Rincon, and Chiricahua Mountains in southern Arizona and the San Luis Mountains in southern New Mexico south to El Salvador.

Arizona: Resident in the southeast, where abundant in some of the border mountain ranges in heavy Upper Sonoran Zone woodlands.

New Mexico: Not listed in most publications as occurring in New Mexico, but Pough (1957) indicated it is found in the San Luis Mountains.

Nest: In natural cavities and old flicker holes, mostly in white oak associations between 4,000 and 6,500 feet. Nests have been found in oak, walnut, juniper, and sycamores (Bent 1961).

Food: The principal diet is insects, including black crickets, hairy caterpillars, moths, grasshoppers, large beetles, and centipedes (Jacot 1931).

Flammulated owl (*Otus flammeolus* (Kaup))



Range: (Migratory) Breeds in forests of ponderosa pine from the Rocky Mountains west to the Pacific Coast and from British Columbia south to Guatemala.

Arizona: Abundant summer resident in most of the Transition Zone, particularly where oaks, or at least some understory, are present. Normally is not found in cut-over forests or in pure stands of ponderosa pine. Common in spruce-fir forests at least in the Pinoleno and Santa Catalina Mountains, and in aspens on Pinal Peak.

New Mexico: Distributed Statewide except on treeless mesas or plains, but is most common in the higher forested mountainous sections.

Nest: In flicker and other woodpecker holes; nests have been reported in dead pine, ash, and aspen trees (Bent 1961).

Food: Apparently largely, if not wholly, insectivorous, though it may occasionally capture a small mammal or bird. In the few stomachs that have been examined, items reported were various beetles, moths, grasshoppers, crickets, caterpillars, ants, other insects, spiders, and scorpions (Bent 1961).

Pygmy owl (*Glaucidium gnoma* Wagler)



Range: (Resident) Western North America, from Alaska to Guatemala, at 5,000 to 10,000 feet.

Arizona: Generally uncommon in woods of Transition Zone and locally in Upper Sonoran Zone of western and central sections.

New Mexico: In ponderosa pine timber types from 6,000 feet upward; most common in the Sacramento and White Mountains and the Black Range.

Nest: Usually in old holes of woodpeckers, ranging in size from the hairy woodpecker up to and including the flicker, from 8 to 20 feet above ground (Bent 1961).

Food: Most is probably mice and larger insects (grasshoppers etc.) but also feeds on smaller mammals, birds, amphibians, and other insects (Bent 1961).

Elf owl (*Micrathene whitneyi* (Cooper))



Range: (Resident) Southern portions of U.S. along the Mexican border and south into central Mexico.

Arizona: Common summer resident in southern Arizona lowlands, less common in central Arizona, ranging through the live oak belt to the lower edge of Transition Zone.

New Mexico: Common summer resident in southwest adjacent to Arizona from the Mexican border into the Gila River Valley.

Nest: Most nests have been reported in abandoned woodpecker holes in saguaro cactus but in wooded areas nests have been reported in old woodpecker holes of cottonwood and sycamore trees (Bent 1961, Ligon 1961).

Food: Almost entirely insects and insect larvae such as crickets, grasshoppers, beetles, caterpillars, centipedes and others (Bent 1961).

Spotted owl (*Strix occidentalis* (Xantus))

Range: (Resident) Pacific coastal forest from southern British Columbia to California, and mountains of California, Arizona, New Mexico, and western Texas south into central and western Mexico.



Arizona: Uncommon resident of the heavily forested mountains and high mesas.

New Mexico: Has been recorded in all of the higher forested mountains but nowhere common. Probably most common in the Mogollon, Black, and San Mateo ranges.

Nest: Usually nests in large tree cavities but will nest in holes in shaded rock gorges (Bent 1961).

Food: Various forest rodents and a few birds (Bent 1961).

Saw-whet owl (*Aegolius acadicus* (Gmelin))

Range: (Partially migratory) Breeds from Nova Scotia, Ontario, eastern Alberta, and southeastern Alaska to Connecticut, the mountains of North Carolina, northern Indiana, Missouri, central Arizona, and in the mountains of southern California through Mexico to Guatemala. In winter, found casually south to Georgia, Louisiana, and southern California.



Arizona: Resident, perhaps fairly common but not often detected, in the eastern, central, and perhaps northwestern mountains.

New Mexico: Few authentic State records; apparently nowhere common but widespread in the mountainous sections.

Nest: Apparently prefers old woodpecker holes, particularly those of flickers, which are nearly the same size (Bent 1961). We found one nest in an abandoned flicker hole in a dead ponderosa pine in the White Mountains of Arizona.

Food: Mostly mice, small rats, young red and flying squirrels, chipmunks, shrews, bats, and other small mammals; a few small birds such as sparrows, juncos, and warblers and a few insects have also been recorded (Bent 1961). Bailey (1928) listed wood mice as a principal food plus some rats, half-grown squirrels, chipmunks, and during the summer, many insects.

Coppery-tailed Trogon (*Trogon elegans* Gould)



Range (Partially migratory)
Southern Arizona, southwest
New Mexico and south Texas to
Costa Rica.

Arizona: Uncommon summer resident of the Huachuca, Santa Rita, Chiricahua, and Santa Catalina mountains.

New Mexico: Rare in the Peloncillo and Animas mountains.

Nest: Generally in large deserted woodpecker holes 12 to 40 feet above ground (Bent 1940) and usually in cottonwood and sycamore snags (Ligon 1961).

Food: Little information on food habits but apparently feeds on both animal and vegetable foods. Bent (1940) reported on two birds. One contained adults and larvae of moths and butterflies, the other contained 68 percent insects and 32 percent fruits. Insect food included grasshoppers, praying mantids, stink bugs, miscellaneous bugs, leaf beetles, hawk moth larvae, sawfly larvae, and miscellaneous larvae. Vegetable food consisted of fruits of cissus and red pepper and undetermined plant fiber.

Common [Red-shafted] flicker

(*Colaptes auratus cafer*
(Gmelin))



Range: (Partially migratory) Breeds from southeastern Alaska to southern Quebec south to southern Mexico. In winter withdraws from the most northern parts of its range and higher mountains.

Arizona: Common summer resident of forested mountains and permanent resident of the wooded Lower Sonoran Zone.

New Mexico: Occurs Statewide during summer; moves southward during fall, and winters in southern part of the State.

Nest: Excavates nest holes, usually in old stubs or trees such as pine, cottonwood, willow, sycamore, and juniper at heights from ground level to 100 feet but usually between 8 and 25 feet; occasionally nests in holes in banks and in the sides of houses, gate posts, etc. (Bent 1964c). We have recorded 10 nests in the White Mountains of Arizona; 5 were in dead ponderosa pine, 2 in dead aspen, and 3 in live aspen at an average of 42 feet above ground.

Food: The favored food is ants; stomachs have been examined that contained over 2,000 individuals. Animal food makes up to 50 to 60 percent of the diet. In addition to ants, some beetles, caterpillars, crickets, spiders, codling moths, etc., are eaten. Acorns are the main vegetable item in the diet, but domestic grains and fruit are taken when available (Bent 1964c).

Gila woodpecker (*Centurus uropygialis* Baird)



Range: (Resident) Central Arizona and edges of adjacent states, west to Imperial Valley of southeast California, south through lower California to south Central Mexico.

Arizona: Common resident throughout Lower Sonoran Zone of southern and western Arizona; rather local in extreme southeast. Less common in low sections of the Upper Sonoran Zone in southern mountains.

New Mexico: Extreme southwest, particularly along the Gila River from the Arizona line to north of Cliff.

Nest: Mostly in saguaro cactus but uses dead trees at higher elevations (Ligon 1961).

Food: Consists of insects of various kinds, such as ants, beetles, grasshoppers, and fruit of saguaro cactus and mistletoe berries from cottonwood, oak, and mesquite trees (Bent 1964c).

Red-headed woodpecker

(*Melanerpes erythrocephalus*
(Linnaeus))



Range: (Partially migratory)
Breeds from southern New Brunswick, southern Quebec, southern Ontario, southern Manitoba, and southeastern Alberta south to Florida and the Gulf Coast and west to central New Mexico, eastern Colorado, and eastern Wyoming.

Arizona: One bird reported in Chiricahua Mountains in 1894.

New Mexico: Occasional throughout the State except in the southwest. Never abundant but most common in the north-central section (Upper Rio Grande Valley), Pecos Valley, and along the Dry Cimarron River in the northeast.

Nest: Excavates nest holes, usually in dead tops or limbs of deciduous trees or in old stumps, more rarely in coniferous and fruit trees, at heights of 8 to 80 feet. Favors old dead stubs without bark (Bent 1964c).

Food: Beal (1911) found the diet to be 34 percent animal and 66 percent vegetable. Animal items were mainly insects, including ants, wasps, beetles, weevils, bees, grasshoppers, crickets, 17-year locusts, and caterpillars. Vegetable items were corn, dogwood berries, huckleberries, strawberries, blackberries, raspberries, mulberries, elderberries, wild black cherries, chokecherries, cultivated cherries, wild grapes, apples, pears, and various seeds. Predation on eggs and young of other birds has been reported.

Acorn woodpecker (*Melanerpes formicivorus* (Swainson))



Range: (Resident) Pacific Coast from southwestern Oregon to southern California, and Arizona, New Mexico, and Texas to South America, in oak woodlands and in coniferous forests where oaks occur scattered or as occasional groves.

Arizona: Common among large oaks in mountains throughout the State except in the extreme north and in Baboquivaris, where rare or local.

New Mexico: Common throughout practically all forested mountains of the State except the extreme north.

Nest: Excavates nest holes and nests communally, mostly in large dead ponderosa pine but occasionally in live and dead oak, sycamore, cottonwood, and large willow trees. They also use cavities in dead trees for communal roosting. Its old nest holes in dead pines are sought for nesting by other pine forest birds such as small owls, purple martins, violet-green swallows, nuthatches, house wrens, and kestrels (Bent 1964c).

Food: Most of the diet is acorns, but almonds, walnuts, and pecans are taken when available. About 25 percent of the diet is animal material and includes grasshoppers, ants, beetles, and flies. Acorns are stored in bark or whitewood of dead pine trees for food supply (Bent 1964c). MacRoberts and MacRoberts (1972) report that sap from several species of oaks is consumed during winter, spring, and summer.

Lewis' woodpecker

(*Asyndesmus lewis* (Gray))



Range: (Partially migratory) Southern British Columbia and southern Alberta, east to South Dakota, west Kansas, and south to New Mexico, Arizona, and mid-California. Absent from the coastal fog belt. Winters south to northern Mexico.

Arizona: Fairly common resident of certain Transition Zone parks in San Francisco Mountains, rarer and local northward and eastward. Rare in White Mountains, with the only mid-summer record near Alpine.

New Mexico: Mostly in higher mountain parks and valleys in the north and uncommonly in the Mogollon and Sacramento Mountains.

Nest: Excavates nest holes, usually in large dead trees, in pine type or in burned or cutover dense pine or fir forest. From the literature, Bock (1970) summarized following nest data: Height range 1.5 to 51.8 meters; 47 nests in dead stubs and 17 in live trees; 29 nests in conifers, 31 in cottonwood and sycamore, 6 in oaks, 2 in power poles, 1 in juniper, and 1 in catalpa. Of 11 nest sites at Boca Reservoir, California, 10 were in dead ponderosa pines, the other in a hollow section of a living pine (Bock 1970).

Food: About two-thirds of the food consists of large black crickets, ants, beetles, flies, larvae of various kinds, and fruits of wild strawberries, serviceberries, salmonberries, pine seeds, juniper berries; the other one-third is acorns. These woodpeckers have been known to damage pomegranates and quinces near Tucson, Arizona, and fruit orchards in the northwest when the orchards were located near forested areas (Bent 1964c).

Yellow-bellied sapsucker

(*Sphyrapicus varius* (Linnaeus))

Range: (Migratory) Breeds from Newfoundland, the south end of James Bay, northern Manitoba, southern Mackenzie, and south-eastern Alaska to New Hampshire, the Virginia Mountains, northern Ohio, central Missouri, New Mexico, and southern California. Winters from southern New Jersey, southern Ohio, Kansas, and southern British Columbia to the west Indies and Central America.



Arizona: Nests in Canadian Zone of mountains along and north of Mogollon Plateau, and irregularly in the Hualapai Mountains. Very rare except in parts of White Mountains, Blue Range, and farther west at Promontory Butte.

New Mexico: Nesting is largely confined to the Transition and Canadian Life Zones of all the mountainous areas in the State.

Nest: Most nest records are from eastern United States, where nest holes are excavated in large dead trees, usually near water; trees recorded were birch, elm, poplar, and butternut (Bent 1964c). Bailey and Niedrach (1965) indicate that, in Colorado, most nests are in deciduous trees.

Food: As the name sapsucker implies, these birds utilize the sap from various trees, but it is difficult to determine the amount taken. Food habits studies indicate that about 16 to 20 percent of the diet is cambium and bast. The remaining vegetable portion of the diet includes fruits of dogwood, black alder, Virginia creeper, wild blackberries, and some nuts. Animal matter eaten includes ants, beetles, wasps, and other insects but not any of the wood-boring larvae (Bent 1964c).

Williamson's sapsucker

(*Sphyrapicus thyroideus*
(Cassin))

Range: (Partially migratory)
Breeds in British Columbia and Montana to mountains of southern California and northern New Mexico. Winters at lower elevations near breeding areas and south to mid-Mexico.



Arizona: Nests from Mogollon Rim northward, more or less commonly.

New Mexico: Confined in summer mostly to dense forests of the Canadian and Hudsonian Zones of the northern mountains.

Nest: Holes are excavated in dead or dying wood 5 to 60 feet above ground. Dawson (Bent 1964c) described the nest site as a pine tree beginning to die at the top, usually in a fairly sheltered situation. Other authors (Bent 1964c; Michael 1936) have reported nests in red firs, larches, white fir, and aspen but always in conifer associations. We have found six nests in Arizona in aspen (three in dead aspen and three in dead tops of living aspen trees).

Food: The small amount of information available indicates that about 87 percent of the diet is animal, nearly all of it ants, and that nearly all the rest is cambium (Beal 1911).

Hairy woodpecker

(*Dendrocopos villosus*
(Linnaeus))



Range: (Resident) Newfoundland, Ontario, southern Manitoba, southwestern Mackenzie, and northwestern Alaska south to Florida, the Gulf Coast, south-central Texas, southern Mexico, and southern California.

Arizona: Common to fairly common resident of coniferous forests throughout the State.

New Mexico: Common to nearly all forested mountains of the State above 6,000 feet.

Nest: Usually excavates nest holes in dead pine trees, frequently at a considerable height above ground (Bent 1964c). We found two nests 35 feet high in live aspen in Arizona.

Food: Prefers to feed on dead and diseased trees and stubs, probably because of increased availability of borers and grubs (Bent 1964c). Animal matter, which made up 79 percent of the diet (Beal 1911), consisted of round-headed and flat-headed borers and a few stag beetle larvae. Ants were second in importance, and weevils, curculios, engraver beetles, ground beetles, caterpillars, bugs, aphids, and other insects made up the rest. A variety of vegetable foods including blackberries, raspberries, corn, poison ivy, poison sumac, acorns, hazelnuts, beechnuts, and cambium make up the remaining 21 percent of the diet. Hairy woodpeckers, along with other species of woodpeckers, have been credited with reducing several forest pests including codling moth larvae in Nova Scotia (MacLellan 1958 and 1959) and bark beetles in Engelmann spruce (Olson 1953; Koplin and Baldwin 1970; Shook and Baldwin 1970).

Downy woodpecker

(*Dendrocopos pubescens*
(Linnaeus))

Range: (Resident) Newfoundland, Ontario, southern Manitoba, southwestern Mackenzie, and northwestern Alaska south to southern Florida, the Gulf Coast, southeastern Texas, southern Mexico, and southern California.



Arizona: Sparse in deciduous trees of Transition and Canadian Zones from White Mountains (where more common), Sierra Ancha, and San Francisco Mountains northward.

New Mexico: Sparse throughout the forested mountains from 6,000 to 8,000 feet; probably most common in the north.

Nest: Makes its own nest holes in branches or stubs 8 to 50 feet above ground, generally in dead or dying wood but sometimes in solid branches (Bent 1964c).

Food: Mostly insects, nearly all of which are economically harmful. Beal (1911) examined 723 stomachs and found the contents to be 76 percent animal and 24 vegetation. Beetles, mostly wood-boring larvae, made up 21.5 percent, ants 21 percent, caterpillars 16.5 percent, weevils 3 percent, and fruit (mostly wild) 6 percent; the remaining food items were not mentioned. Like the hairy woodpecker, the downy woodpecker has been credited with reducing forest pests (MacLellan 1958, 1959; Olson 1953).

Arizona woodpecker

(*Dendrocopos arizonae*
(Hargitt))



Range: (Resident) Mountains of southern Arizona and southwestern New Mexico to south-central Mexico.

Arizona: Fairly common resident of live oaks in southeastern Arizona, west and north to Baboquivari, Santa Catalina, and Graham Mountains, at 4,000 to 7,500 feet.

New Mexico: Occurs only in the extreme southwest corner of the State (Peloncillo and Animas Mountains), where it is common in the oak-juniper foothills up to 7,000 feet.

Nest: In Arizona, usually excavates nest holes in dead branches of walnut trees, but nests have been found in dead branches of oak and maple, and one nest was reported in a mescal stalk (Bent 1964c).

Food: Few details have been reported, but apparently the diet is mainly adult and larval insects, with some fruits and acorns (Bent 1964c).

Northern three-toed woodpecker

(*Picoides tridactylus* (Linnaeus))

Range: (Resident) North to the limit of trees in North America, Europe, and Asia, south to northern New Hampshire, northern Michigan, northern Minnesota, and in mountains to southwestern Oregon and Arizona.



Arizona: Uncommon resident in Boreal Zones, rare in Transition Zone, from White to San Francisco Mountains and on Kaibab Plateau.

New Mexico: Found in greatest numbers around the higher peaks of the Sangre de Cristo Range; less numerous in San Juan, Jemez, and Zuni and sparingly in the highest parts of the Black and Mogollon Ranges.

Nest: Most reported nests have been 7 to 60 feet above ground in cavities of dead pine trees. Nests have also been found in dead aspen and spruce (Bent 1964c).

Food: The literature indicates this is one of the most beneficial woodpeckers. Bailey (Bent 1964c) indicated that over 75 percent of the diet consists of destructive wood-boring larvae of beetles. Beal (1911) estimated that each three-toed woodpecker annually destroys some 13,675 of the grubs most destructive to forests. Olson (1953), Shook and Baldwin (1970), and Yeager (1955) mention the benefits of the three-toed woodpecker in control of the spruce bark beetle.

Ash-throated flycatcher

(*Myiarchus cinerascens*
(Lawrence))



Range: (Partially migratory)
Breeds from central Washington, northern Utah, and west-central Texas south and west through northern Mexico to the Pacific.

Arizona: Common summer resident throughout all but the densely wooded parts of the Sonoran Zones.

New Mexico: Common summer resident throughout the State except along the east side where it is less numerous. Ranges up to 7,500 feet in the more mountainous sections.

Nest: Usually nests in woodpecker holes and natural cavities, but also exposed pipes, nest boxes, and knotholes of mesquite, ash, oak, sycamore, juniper, and cottonwood trees (Bent 1963).

Food: About 92 percent of the diet is animal matter (beetles, bees, wasps, bugs, flies, caterpillars, moths, grasshoppers, other miscellaneous insects and spiders) and 8 percent vegetable (mistletoe, berries, and other fleshy fruits) (Bent 1963).

Olivaceous flycatcher

(*Myiarchus tuberculifer*
(Lafresnaye and D'Orbigny))



Range: (Partially migratory)
Breeds from mountains of
southeastern Arizona to South
America.

Arizona: Summer resident of denser live oaks, and higher Lower Sonoran riparian associations of Santa Cruz River drainage, from Guadalupe Mountains.

New Mexico: Rare but has been found in San Luis Mountains and just south of the International Boundary in Devil's Canyon.

Nest: Nests in natural cavities and old woodpecker holes; most nests have been reported in oaks (Bent 1963).

Food: Limited evidence on food habits indicates the major food items are small insects including grasshoppers, termites, mayflies, treehoppers, miscellaneous bugs, moths, bees, wasps, and spiders (Bent 1963).

Violet-green swallow

(*Tachycineta thalassina*
(Swainson))

Range: (Migratory) Breeds from central Alaska and central Alberta south to northern Mexico and east to western South Dakota and western Nebraska. Winters from Mexico, occasionally southern California, to Costa Rica.



Arizona: Common summer resident in most of the Transition and Canadian Zones.

New Mexico: Uncommon but widespread in the yellow pine zone from about 7,000 feet in the Sacramento and Mogollon Mountains and the Black Range to more than 11,000 feet in the Sangre de Cristos.

Nest: In holes, cavities, and crevices in a variety of situations. Where the birds are abundant, the demand for nest sites is sometimes greater than the supply, and practically any available cavity may be used. Where nesting sites are numerous, the swallows often form colonies, with many nests in a suitable tree or cliff. Morrison (1888) "has seen as many as 20 pair in a single dead pine and four or five pair in one limb which had been used first by the woodpeckers" in Colorado (Bent 1963). Violet-greens have been reported to use old nests of cliff swallows and even burrows of bank swallows. In Arizona, they usually nest in abandoned woodpecker holes high up on the mountains in the pine belt. We have found 28 nests in the White Mountains of Arizona; three were in dead tops of ponderosa pines, while all others were in dead ponderosa pines. Nests ranged from 30 to 70 feet above ground.

Food: Apparently, the diet is exclusively insects taken on the wing. It includes leafhoppers, leaf bugs, flies, flying ants, and some wasps, bees, and beetles (Bent 1963).

Tree swallow (*Iridoprocne bicolor* (Vieillot))



Range: (Migratory) Breeds from Newfoundland, northern Manitoba, Mackenzie, and northern Alaska to Maryland, north-central Louisiana, Colorado and southwestern California. Winters from North Carolina and Gulf Coast, northern Mexico, and southern California through Cuba to Guatemala.

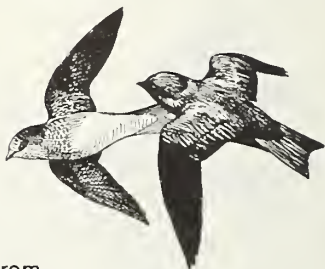
Arizona: Probably does not nest in Arizona, but does nest as far south as Durango, Colorado.

New Mexico: Only one nest reported for the State, on the Bosque del Apache Wildlife Refuge.

Nest: Prefers to nest in natural cavities and old woodpecker holes, but will utilize nest boxes. Usually nests in rather open forests, although large colonies have been found nesting in cavities of dead trees projecting out of water (Bent 1963).

Food: About 80 percent of the diet is animal (beetles, ants, flies, grasshoppers, dragonflies, spiders), and the rest fruits such as bayberry (Beal 1918).

Purple martin (*Progne subis* (Linnaeus))



Range: (Migratory) Breeds from Canada south to Mexico.

Arizona: Breeds in the Transition Zone of open parts of the entire Mogollon Plateau region, even to such areas as Williams, Mount Trumbull, the Natanes Plateau, the Sierra Ancha, and the Prescott region, and also in the Chiricahua Mountains, but is absent from the other mountains of southern Arizona, the Grand Canyon, and the northeast. Also breeds in saguaro associations of south-central Arizona west to the Ajo Mountains and north near Picacho, Florence, Roosevelt Lake, and the lower San Pedro Valley.

New Mexico: Ligon (1961) reported sparse nesting in all of the higher forested mountains of the State, usually from 7,000 to 9,000 feet.

Nest: The western purple martin has not adapted to nest box nesting as has the eastern form (Bunch 1964), but instead depends on holes made by woodpeckers, usually in tall pines in relatively open timber stands (Bent 1963). Also nests in holes of saguaro cactus. We have observed as many as six pairs nesting in one dead ponderosa pine near Cibecue, Arizona.

Food: Apparently is almost entirely insects, most taken on the wing. Beal (1918) found only a few spiders; the rest were true insects and included ants, wasps, house flies, long-legged tipulids, stink bugs, treehoppers, negro bugs, May beetles, dung beetles, cotton boll and clover weevils, and a few bees.

Black-capped chickadee (*Parus atricapillus* Linnaeus)



Range: (Partially migratory) The northern hemisphere. In North America from Newfoundland, central Quebec, northern Ontario, central Mackenzie, and central Alaska to northern New Jersey, northern California mountains, Indiana, southern Missouri, northern New Mexico and northwestern California. In winter south to Maryland and central Texas.

Arizona: Possible winter visitor in Mogollon Plateau.

New Mexico: Confined almost wholly to the northern high forested mountains from about 7,500 feet to timberline. Most common in the mountains east of the Rio Grande from Santa Fe and Pecos northward.

Nest: Sometimes nests in natural cavities and deserted holes of woodpeckers, but usually makes its own hole in decaying wood of dead trunks or limbs of deciduous trees (Bent 1964a).

Food: The diet is about 70 percent animal and 30 percent vegetable (Bent 1964a). Mast, chiefly from coniferous trees, and fruits of such plants as bayberry, poison ivy, and blueberries make up the bulk of the vegetable part of the diet. A variety of animals are eaten, mainly insects; most important are caterpillars and eggs of lepidoptera, spiders, beetles, true bugs, ants, and sawflies.

Mexican chickadee (*Parus sclateri* Kleinschmidt)



Range: (Resident) Pine and spruce forests of Chiricahua Mountains of southeastern Arizona (7,000 to 10,000 feet) and mountains of extreme southwestern New Mexico.

Nest: Excavates nest hole in dead trees or branches (Bent 1964a).

Food: No information found in the literature.

Mountain chickadee (*Parus gambeli* Ridgway)



Range: (Resident) Mountains from Canada to western Texas, New Mexico, Arizona, and southern California.

Arizona: Common in pine and spruce-fir forest, locally into pinyon-juniper in northeastern Arizona, and throughout mountains except Hualapais and Mexican border ranges.

New Mexico: Common summer resident in mountain areas from 7,500 feet to timberline. May be found as low as 5,000 feet at Shiprock and Guadalupe Mountains during winter.

Nest: Usually nests in natural cavities or old woodpecker holes; probably does not excavate a cavity if it can find one already made. Nests vary from 2 to 80 feet above ground, but usually are below 15 feet (Bent 1964a). Nests have been found in pine stumps, aspen, and under rocks. We have found nests in both aspen and dead ponderosa pine trees in Arizona.

Food: Food habits studies of the mountain chickadee are apparently lacking. Telford and Herman (1963) collected 10 birds in the Inyo National Forest where there was an infestation of lodgepole needle miner, and found 639 needle miner caterpillars in their stomachs.

Plain titmouse (*Parus inornatus* Gambel)



Range: (Resident) From southern Oregon, northern Nevada, northern Utah, and central Colorado to west Texas, southern New Mexico, and southern California.

Arizona: Fairly common in Upper Sonoran Zone of northwestern, northern, central and, locally, southeastern Arizona.

New Mexico: Common in the wooded foothills of the Upper Sonoran Zone east to Guadalupe and Capitan Mountains, Montoya, and Dry Cimarron. Usually from 5,000 to 7,000 feet.

Nest: Usually in natural cavities or old woodpecker holes, but one bank nest has been reported. Most reported nests have been in oaks 2 to 23 feet above ground (Bent 1964a).

Food: Beal (Bent 1964a) examined 76 stomachs and found 43 percent animal material (bugs 12 percent, caterpillars 11 percent, beetles 7 percent, ants and wasps 6 percent, daddy longlegs and grasshoppers 5 percent, spiders 1 percent, and 1 percent unreported) and 57 percent vegetable material (cherries and pulp of larger fruit and leaf galls 32 percent, seeds of poison oak and weeds 25 percent).

Bridled titmouse (*Parus wollweberi* (Bonaparte))



Range: (Resident) Central and southeastern Arizona, southwestern New Mexico, south to southern Mexico.

Arizona: Common in southeastern and central Upper Sonoran woodlands, 5,000 to 7,000 feet.

New Mexico: Uncommon in Animas and Peloncillo Mountains; north to Alma and the Pinus Alto Mountains, from 5,500 to 6,500 feet.

Nest: Nearly all recorded nests have been in natural cavities of dead and living oak trees 4 to 28 feet above ground (Bent 1964a).

Food: No published information found, but the diet is probably similar to that of other members of this genus. All live in similar habitats and spend much of their time foraging in crevices in the bark, on the trunks, and on branches of oaks, presumably hunting for adults, larvae, and eggs of insects (Bent 1964a).

White-breasted nuthatch (*Sitta carolinensis* Latham)



Range: (Resident) From southern Quebec, central Ontario, southern Manitoba, and southern British Columbia to Florida, the Gulf Coast, and southern Mexico.

Arizona: Rather common throughout Transition and Lower Canadian Zones, also locally among larger trees of Upper Sonoran Zone.

New Mexico: Quite common in practically all forested areas from 7,000 to 8,000 feet, and has been noted up to 10,000 feet in the Mogollon Mountains.

Nest: Usually nests in natural cavities or old woodpecker holes, though has been reported to excavate nest holes in decayed trees (Bent 1964b). We have found nests in dead aspen and in dead portions (lightning strikes) of live ponderosa pine.

Food: Feeds freely on beechnuts, acorns, hickory nuts, and maize, and is fond of sunflower seeds. Nearly all winter food is mast, but much animal food is taken in spring and summer, chiefly beetles, spiders, caterpillars, true bugs, ants, flies, grasshoppers, moths, and millipedes (Bent 1964b). Among the insect foods are several forest pests, including nut weevils, locust seed weevils, roundheaded woodborers, leaf beetles, treehoppers, psyllids, scale insects, caterpillars, and ants.

Red-breasted nuthatch (*Sitta canadensis* Linnaeus)

Range: (Partially migratory)
Breeds from Newfoundland, southern Quebec, northern Manitoba, central Yukon, and southeastern Alaska, to Massachusetts, southwestern North Carolina mountains, Michigan, Colorado, and southern California mountains. In winter occasionally reaches northern Florida, the Gulf Coast, and northern Mexico.



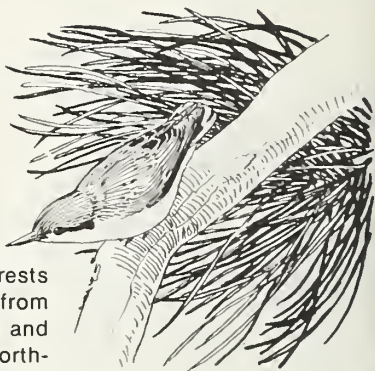
Arizona: Common resident in all, or nearly all, of the Boreal Zones. During fall sometimes found in Transition and Sonoran Zones, usually in large trees but casually in desert shrubs.

New Mexico: Uncommon fall and winter visitor, but apparently does not nest in New Mexico.

Nest: Usually excavates nest holes 5 to 40 feet above ground in rotten stubs or branches of dead trees, but sometimes uses old woodpecker holes; has been known to nest in bird boxes (Bent 1964b). Nests have been reported in birch, poplar, deadwood of living cottonwood, oak, and ponderosa pine.

Food: Little is known of the food taken, but this nuthatch is fond of seeds of pines, spruces, and other coniferous trees. The animal food is known to include beetles, hymenoptera, spiders, and ribbed pine borers. Sometimes feeds on flying insects like a flycatcher (Bent 1964b).

Pygmy nuthatch (*Sitta pygmaea* Vigors)



Range: (Resident) Pine forests of western North America from southern British Columbia and northern Idaho south to northern Lower California and south-eastern Mexico.

Arizona: Abundant in ponderosa pines throughout Arizona and to some extent in adjacent heavy pinyon-juniper.

New Mexico: Found throughout the State in all forested mountains. Common in northern Santa Fe County from 7,500 to 10,000 feet.

Nest: Nearly all reported nests have been from 8 to 60 feet above ground in cavities of pine or dead remains of pine trees excavated by the bird (Bent 1964b). We found 20 nests in the White Mountains, all in dead ponderosa pine trees.

Food: About 80 percent of the diet is animal material, mostly wasps and spittle insects, including some ants, beetles, and caterpillars; the balance is nearly all seeds of conifers (Bent 1964b).

Brown creeper (*Certhia familiaris* Linnaeus)

Range: (Partially migratory) Breeds throughout much of the northern hemisphere. In North America from Nova Scotia, eastern Ontario, southern Manitoba, and central Alaska south to Massachusetts, North Carolina mountains, Indiana, and eastern Nebraska, and in the western mountains south to northern Nicaragua. Winters to southern Florida, the Gulf Coast, and central Texas.



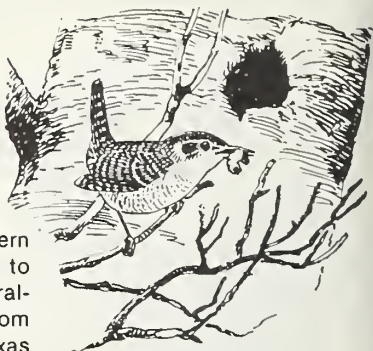
Arizona: Rather common summer resident of Boreal Zones and in the south, the Transition Zone, throughout Arizona, wintering uncommonly through Transition Zone and Upper Sonoran woodlands.

New Mexico: Largely confined to forested mountains at 7,000 to 11,000 feet; rarely in the Animas and Peloncillo Mountains.

Nest: Sometimes nests in natural cavities and old woodpecker holes, but generally makes its nest between the loose bark and the trunk of a large dead tree (Bent 1964b).

Food: Few details are known, but the diet is mainly insect, including weevils, leafhoppers, flat bugs, jumping plant lice, scale insects, eggs of katydids, ants, and other small hymenoptera, sawflies, moths, caterpillars, cocoons of the leaf skeletonizers, pupae of the codling moth, spiders, and pseudoscorpions (Bent 1964b). The small amount of vegetable matter eaten is chiefly mast.

House wren (*Troglodytes aedon* Vieillot)



Range: Breeds in the western U.S. from Canada south to Mexican border and central-western Texas; winters from central California and Texas south into Mexico.

Arizona: Common summer resident in dense brush and fallen trees from Transition Zone to timberline in all forested mountains. Winters commonly in better-vegetated areas of Lower Sonoran Zone of the Southwest and the Lower Colorado Valley east to the Phoenix region, Tucson, and Patagonia.

New Mexico: Common in practically all wooded foothills and forested mountains up to 10,000 feet. Less common at higher elevations, but has been reported to timberline in the Sangre de Cristo Range.

Nest: Utilizes many sites including bank holes, crevices in rocks, deserted buildings, and cavities in trees. Usually nests less than 10 feet above ground in cavities or crevices in stumps, fallen or standing trees, including old woodpecker holes, but also accepts nearly any form of bird box (Bent 1964b; Robbins et al. 1966).

Food: Nearly all of the diet is animal material including beetles, caterpillars, bugs, grasshoppers, ants, etc. (Bent 1964b).

Brown-throated wren

(*Troglodytes brunneicollis*
Sclater)



Range: (Partially migratory)
Mountain woodlands from
southern Arizona to Oaxaca.

Arizona: Uncommon resident at
7,000 to 8,000 feet in south-
eastern Arizona mountains.

New Mexico: Not reported in New Mexico.

Nest: In cavities or old woodpecker holes in tree trunks or limbs,
and will sometimes occupy nest boxes and recesses about
buildings (Pough 1957).

Food: No published information, but the diet is probably similar
to that of the western house wren.

Winter wren (*Troglodytes troglodytes* (Linnaeus))



Range: (Migratory) Breeds in evergreen forests from Canada to central California and northern Colorado. Winters from Canada to southern California and New Mexico.

Arizona: Local and rare winter resident, generally in the most dense brush of the more permanent streams of Transition and adjacent zones. Records are listed from Grand Canyon, Oak Creek, and White, Huachuca, and Santa Catalina Mountains.

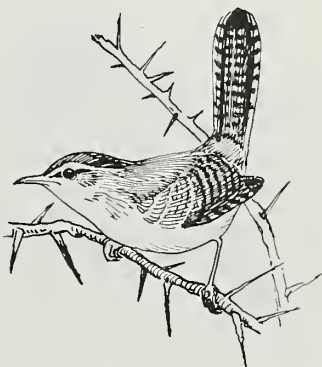
New Mexico: Rare visitor September to April.

Nest: In small holes and crannies in upturned roots or fallen logs, and fire holes in half-burned stumps (Bent 1964b).

Food: Details have not been published, but the diet appears to be largely or entirely adult and larval insects (Bent 1964b).

Bewick's wren (*Thryomanes bewickii* (Audubon))

Range: (Partially migratory) Breeds from central Pennsylvania to Michigan, southern Nebraska, southern Utah, and southern British Columbia to western South Carolina, central Alabama, central Arkansas, and southern Mexico. Wanders to central Florida and the Gulf Coast in winter.



Arizona: Common resident in Upper Sonoran brush and woodland south of the Salt and west of the Verde Valley; summer resident locally and generally uncommon in pinyon-juniper zone over the rest of the State, and in mesquite-willow-cottonwood associations along parts of Lower Sonoran Zone rivers.

New Mexico: Fairly common in sections of oak, pinyon, and juniper foothills mainly in southern half of the State from 4,000 to 7,000 feet. Ligon (1961) reports the Bewick's wren most common in foothills of the Black, Mogollon, and Guadalupe Ranges, Animas and Peloncillo Mountains.

Nest: Away from man, nests in knotholes in fallen trees in woods or open fields, or in natural cavities or woodpecker holes in trees. Around civilization, will use holes in fence posts, tin cans, empty barrels, bird boxes, deserted automobiles, and crevices in stone, brick, or tile walls (Bent 1964b).

Food: The Bewick's wren is probably an insectivorous bird, as are the rest of the wrens, but apparently no intensive food habit studies have been made.

Eastern bluebird (*Sialia sialis* (Linnaeus))

Range: (Partially migratory) Breeds from Newfoundland, southern Quebec, northern Ontario, and southern Manitoba south to southern Florida, the Gulf Coast, and Honduras; west to eastern Montana, eastern Colorado, west-central Texas, southeastern Arizona, and Sinaloa. Winters from southern New England and southern Michigan south.



Arizona: Rare and local resident in the live oaks and nearby pines from the Huachuca Mountains west to beyond Nogales. Possibly in Chiricahua Mountains also.

New Mexico: Not reported as occurring in New Mexico.

Nest: In natural cavities and woodpecker holes, and has adapted well to nesting in man-made structures (Bent 1949).

Food: Nearly 70 percent of the diet is animal material, mainly grasshoppers, crickets, katydids, and beetles but with some ants, wasps, bees, bugs, moths, caterpillars, spiders, myriapods, towbugs, snails, and angleworms (Bent 1949). The vegetable portion of the diet is largely wild fruits.

Western bluebird (*Sialia mexicana* Swainson)



Range: (Partially migratory) Breeds from British Columbia, western Montana, and central Colorado to Central America. Scatters in winter, often to lower elevations.

Arizona: Common summer resident in open Transition and lower Canadian Zones (and in the northeast, among the larger trees of Upper Sonoran woodlands) west to the Santa Catalina, Bradshaw, and the Hualapai Mountains and Mount Trumbull. Not so common in southern mountains.

New Mexico: Breeds throughout practically all forested mountains of New Mexico from 6,500 to 9,000 feet, usually among ponderosa pines.

Nest: Usually in old woodpecker holes but will use natural cavities. Nests have been reported in oak, sycamore, and pine trees. In Monterey County, California all nests found were from 5 to 40 feet above ground in pine stumps or trees (Bent 1949). This bluebird, like the eastern, also readily nests near houses in bird boxes.

Food: Beal (Bent 1949) examined 217 stomachs and found 72 percent animal material (grasshoppers 21 percent, caterpillars 20 percent, useful beetles 9 percent, other beetles 16 percent, ants 5 percent, other hymenoptera 1 percent) and 28 percent vegetable material, mostly wild fruits including elderberries, mistletoe berries, blackberries or raspberries, prunes, cherries, and a few weed seeds.

Mountain bluebird (*Sialia currucoides* (Bechstein))

Range: (Partially migratory) Breeds from southeastern Manitoba, central Saskatchewan, northwestern British Columbia, and southern Yukon south to Chihuahua and from western Nebraska to the Cascade, Sierra Nevada, and San Bernardino Mountains. Winters from Colorado to Oregon south through northern Mexico and east to Kansas and eastern-central Texas.



Arizona: Common summer resident of northern open areas from pinyon-juniper woodland up to timberline, south to the entire Mogollon Plateau, and west to Ashfork and beyond Mount Trumbull.

New Mexico: Common summer resident throughout the forested mountains, from the southern portion of the Black and Pinos Altos Ranges northward to the Colorado line and east to the Sacramento and Capitan Mountains.

Nest: Like other bluebirds, usually nests in natural cavities or in old woodpecker holes, but also readily nests in man-made structures and in almost any available cavity near human habitation. We have found nests in woodpecker holes and natural cavities in dead ponderosa pine in the White Mountains of Arizona.

Food: Probably more insectivorous than other bluebirds. Studies indicate that nearly 92 percent of the diet is animal material, including miscellaneous beetles, weevils, ants, bees, wasps, cicadas, stinkbugs, negro bugs, assassin bugs, jassids, flies, caterpillars, grasshoppers, locusts, and crickets (Bent 1949). Vegetable items were currants, grapes, elderberries, sumac seeds, mistletoe berries, hackberry seeds, Virginia creeper seeds, and cedar berries.

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Appendix I: Plant Species Referred to in Text

Common Name	Scientific Name
Alder, black	<i>Alnus</i> sp.
Almonds	<i>Prunus</i> sp.
Apples	<i>Malus</i> sp.
Ash	<i>Fraxinus</i> sp.
Aspen	<i>Populus</i> sp.
Aspen, quaking	<i>Populus tremuloides</i> Michx.
Bayberries	<i>Myrica</i> sp.
Beechnut	<i>Fagus grandifolia</i> Ehrh.
Birch	<i>Betula</i> sp.
Blackberries	<i>Rubus</i> sp.
Black cherry	<i>Prunus serotina</i> Ehrh.
Blueberries	<i>Vaccinium</i> sp.
Butternut	<i>Juglans cinerea</i> L.
Catalpa	<i>Catalpa speciosa</i> Warder
Cedar	<i>Juniperus</i> sp.
Cherries	<i>Prunus</i> sp.
Chokecherry	<i>Prunus virginiana</i> L.
Cissus	<i>Cissus trifoliata</i> L.
Corn	<i>Zea mays</i>
Cottonwood	<i>Populus</i> sp.
Currants	<i>Ribes</i> sp.
Dogwood	<i>Cornus</i> sp.
Douglas fir	<i>Pseudotsuga menziesii</i> (Mirb.) Franco
Elderberries	<i>Sambucus</i> sp.
Elm	<i>Ulmus</i> sp.
Fir	<i>Abies</i> sp.
Fir, red	<i>Abies magnifica</i> A. Murr.
Fir, subalpine	<i>Abies lasiocarpa</i> (Hook.) Nutt.
Fir, white	<i>Abies concolor</i> (Gord. & Glend.) Lindl.
Grapes, wild	<i>Vitis</i> sp.
Hackberry	<i>Celtis</i> sp.
Hazelnuts	<i>Corylus</i> sp.
Hickory nuts	<i>Carya</i> sp.
Huckleberries	<i>Gaylussacia</i> sp.
Juniper	<i>Juniperus</i> sp.
Juniper, alligator	<i>Juniperus deppeana</i> Steud.
Juniper, one-seed	<i>Juniperus monosperma</i> (Engelm.) Sarg.
Juniper, Rocky Mt.	<i>Juniperus scopulorum</i> Sarg.
Juniper, Utah	<i>Juniperus osteosperma</i> (Torr.) Little
Larch	<i>Larix</i> sp.
Maize	<i>Sorghum vulgare</i> Pers.
Maple	<i>Acer</i> sp.
Mescal	<i>Agave</i> sp.
Mesquite	<i>Prosopis</i> sp.
Mistletoe	<i>Phoradendron</i> sp.

Common Name	Scientific Name
Mulberries	<i>Morus</i> sp.
Oak	<i>Quercus</i> sp.
Oak, Arizona white	<i>Quercus arizonica</i> Sarg.
Oak, emory	<i>Quercus emoryi</i> Torr.
Oak, gray	<i>Quercus grisea</i> Liebm.
Oak, Mexican blue	<i>Quercus oblongifolia</i> Torr.
Pears	<i>Pyrus</i> sp.
Pecans	<i>Carya</i> sp.
Pine	<i>Pinus</i> sp.
Pine, limber	<i>Pinus flexilis</i> James
Pine, pinyon	<i>Pinus edulis</i> Engelm.
Pine, ponderosa	<i>Pinus ponderosa</i> Laws.
Poison ivy	<i>Toxicodendron radicans</i> Kuntze
Poison oak	<i>Toxicodendron quercifolium</i> (Michx.) Greene
Pomegranate	<i>Punica granatum</i> L.
Poplar	<i>Liriodendron tulipifera</i> L.
Prunes	<i>Prunus</i> sp.
Quinces	<i>Cydonia</i> sp.
Raspberries	<i>Rubus</i> sp.
Red peppers	<i>Piper</i> sp.
Saguaro cactus	<i>Carnegiea gigantea</i> (Engelm.) Britt. & Rose
Salmonberry	<i>Rubus spectabilis</i> Pursh.
Serviceberries	<i>Amelanchier</i> sp.
Spruce	<i>Picea</i> sp.
Spruce, Engelmann	<i>Picea engelmanni</i> Parry
Strawberries	<i>Fragaria</i> sp.
Sumac	<i>Rhus</i> sp.
Sunflowers	<i>Helianthus</i> sp.
Sycamore	<i>Platanus</i> sp.
Virginia creeper	<i>Parthenocissus quinquefolia</i> L.
Walnuts	<i>Juglans</i> sp.
Willow	<i>Salix</i> sp.

Appendix II: Mammals and Reptiles Referred to in Text

Common Name	Order	Family	Genus and Species
Bats	Chiroptera		
Chipmunks	Rodentia	Sciuridae	
Flying squirrels	Rodentia	Sciuridae	<i>Glaucomys volans</i> (Linnaeus)
Frogs	Class Amphibia		
Lizards	Gekkonidae		
Moles	Insectivora	Talpidae	
Mice	Rodentia	Cricetidae	
Rats	Rodentia		
Red squirrels	Rodentia	Sciuridae	<i>Tamiasciurus</i> sp.
Shrews	Insectivora	Soricidae	
Toads	Class Amphibia		

Appendix III:

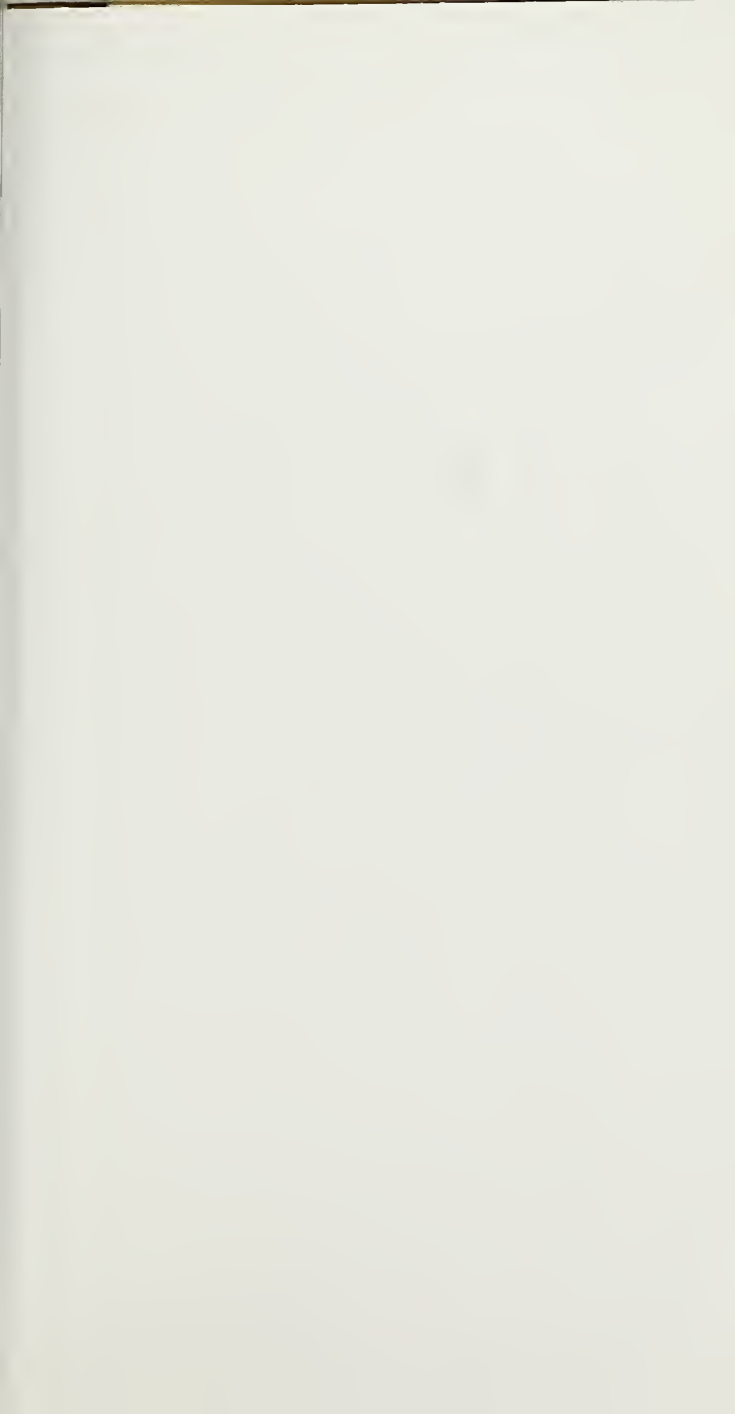
Insects and Other Invertebrates Referred to in Text

Common Name	Class or Order	Family	Genus and Species
Angleworms	Class Oligochaeta		
Ants	Hymenoptera	Formicidae	
Aphids	Homoptera	Aphididae	
Assassin bugs	Hemiptera	Reduviidae	
Black cricket	Orthoptera	Gryllidae	
Bees	Hymenoptera	Apidae	
Beetles	Coleoptera		
Bugs	Hemiptera		
Butterflies	Lepidoptera		
Caterpillars	Lepidoptera		
Centipedes	Class Chilopoda		
Cicadas	Homoptera	Cicadidae	
Clover weevil	Coleoptera	Curculionidae	
Codling moth	Lepidoptera	Olethreutidae	<i>Carpocapsa pomonella</i> Linn.
Cottonboll weevil	Lepidoptera	Gelechiidae	
Crawfish	Class Crustacea		
Crickets	Orthoptera	Gryllidae	
Curculios	Coleoptera	Curculionidae	<i>Curculio</i> sp.
Cutworms	Lepidoptera	Noctuidae	
Daddy longlegs	Phalangida		
Dragon flies	Odonata		
Dung beetles	Coleoptera	Scarabaeidae	
Earthworms	Class Oligochaeta		
Engraver beetles	Coleoptera	Scolytidae	
Flatbugs	Hemiptera	Aradidae	
Flatheaded wood borers	Coleoptera	Buprestidae	
Flies	Diptera		
Flying ants	Hymenoptera	Formicidae	
Grasshoppers	Orthoptera	Acrididae	
Ground beetles	Coleoptera	Carabidae	
Hairy caterpillars	Lepidoptera		
Hawk moth	Lepidoptera	Sphingidae	
Hellgrammites	Neuroptera	Corydelidae	
House flies	Diptera	Muscidae	<i>Musca domestica</i> L.
Insects	Class Insecta		
Jassids	Homoptera	Cicadellidae	
Jumping plant lice	Homoptera	Psyllidae	
June beetles	Coleoptera	Scarabaeidae	
Katyids	Orthoptera	Tettigoniidae	

Common Name	Class or Order	Family	Genus and Species
Leaf beetles	Coleoptera	Chrysomelidae	
Leafhoppers	Homoptera	Cicadelliadae	
Leaf skeletonizers	Lepidoptera	Lyoniidae	<i>Bucculatrix</i> sp.
Locusts	Orthoptera	Acrididae	
Locust seed weevils	Coleoptera	Mylabridae	<i>Bruchus</i> sp.
Lodgepole needle miner	Lepidoptera	Gelechiidae	<i>Coleotechnites</i> sp.
Long-legged tipulids	Diptera	Tipulidae	
May beetles	Coleoptera	Scarabaeidae	
Mayflies	Ephemeroptera		
Millipedes	Class Diplopoda		
Mosquitoes	Diptera	Culicidae	
Moths	Lepidoptera		
Myriapods	Classes Diplopoda & Chilopoda		
Negro bugs	Hemiptera	Corimelaenidae	
Noctuid moths	Lepidoptera	Noctuidae	
Nut weevils	Coleoptera	Curculionidae	
Praying mantids	Orthoptera	Mantidae	
Pseudoscorpions	Pseudoscorpionida		
Psyllids	Homoptera	Psylliidae	
Ribbed pine borer	Coleoptera	Cerambycidae	<i>Stenocorus inquisitor</i> (Oliv.)
Round-headed woodborer	Coleoptera	Cerambycidae	
Sawflies	Hymenoptera	Tenthredinidae	
Scale insects	Homoptera	Coccidae	
Scorpions	Scorpionida		
Snails	Class gastropoda		
Spiders	Araneida		
Spruce bark beetle	Coleoptera	Scolytidae	<i>Dendroctonus</i> sp.
Stag-beetle	Coleoptera	Lucanidae	
Stinkbugs	Hemiptera	Pentatomidae	
Termites	Isoptera		
Towbugs	Hemiptera		
Treehoppers	Homoptera	Membracidae	
Wasps	Hymenoptera	Vespidae	
Weevils	Coleoptera	Curculionidae	

Observations

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